N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

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Research Design

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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

Causality

A  \( \rightarrow \)  B
Pressure  \( \rightarrow \)  Ulcer

Multicausality

Years smoking  \( \rightarrow \)  Heart disease
High fat diet  \( \rightarrow \)  Heart disease
Limited exercise  \( \rightarrow \)  Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

- Measure of accuracy of a study

- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- Controlling the treatment
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- Controlling extraneous variables
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?

Yes

Is the primary purpose examination of relationships?

No

Descriptive Design

Yes

Will the sample be studied as a single group?

No

Quasi-Experimental Study

Yes

Will a randomly assigned control group be used?

No

Correlational Design

Yes

Is the original sample randomly selected?

No

Experimental Study

Yes
Selecting a Descriptive Design

Examining sequences across time?

- No
  - One Group?
    - No
      - Comparative Descriptive Design
    - Yes
      - Descriptive Design

- Yes
  - Following same subjects across time?
    - No
      - Data collected across time
        - No
          - Cross-sectional design
        - Yes
          - Studying events partitioned across time?
            - No
              - Trend Analysis
            - Yes
              - Repeated measures of each subject
                - Yes
                  - Case Study
                - No
                  - Longitudinal Study

- Single unit of study
  - Yes
    - Longitudinal design with treatment partitioning

Research Design

Cross-sectional design with treatment partitioning

Dated: 15
A Typical Descriptive Design

 Clarification ➔ Measurement ➔ Description ➔ Interpretation

 Phenomenon of Interest

 Variable 1 ➔ Description of Variable 1

 Variable 2 ➔ Description of Variable 2

 Variable 3 ➔ Description of Variable 3

 Variable 4 ➔ Description of Variable 4

 Interpretation of Meaning

 Development of Hypotheses
## Selecting the Type of Correlational Design

<table>
<thead>
<tr>
<th>Describe relationships between/among variables?</th>
<th>Predict relationships between/among variables?</th>
<th>Test theoretically proposed Relationships?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptive correlational design</td>
<td>Predictive correlational design</td>
<td>Model testing design</td>
</tr>
</tbody>
</table>
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Description of variable

Research Variable 2

Development of Hypotheses
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

<table>
<thead>
<tr>
<th>Control Group?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>Pretest?</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>One-group post-test only design</td>
</tr>
<tr>
<td>Comparison with population values?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Repeated Measures?</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Strategy for Comparison</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Suggest Reevaluating design</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Compare treatment &amp; control conditions?</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>One group pretest/post-test design</td>
</tr>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>
Selecting The Type of Experimental Design

- **Pretest**
  - No
    - Post-test only control group design
  - Yes
    - Repeated Measurements?
      - No
        - Examine effects of confounding variables?
          - No
            - Multiple sites?
              - Pretest/post-test control group design
          - Yes
            - Blocking?
              - No
                - Comparison of multiple levels of treatment
                - Randomized clinical trials
              - Yes
                - Randomized Block Design
  - Yes
    - Repeated measures design

- Examination of complex relationships among variables in relation to treatment
- Nested Designs
### Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>Randomly selected control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement of dependent variables</td>
<td>Measurement of dependent variables</td>
</tr>
<tr>
<td>Manipulation of independent variables</td>
<td>Manipulation of independent variables</td>
</tr>
</tbody>
</table>

**Flowchart:**
- **PRETEST** → **TREATMENT** → **POST-TEST**

**Treatment:** Under control of researcher

**Findings:**
- Comparison of pretest and post-test scores
- Comparison of experimental and control groups
- Comparison of pretest-post-test differences between samples

**Example:** Your self (1990). The impact of group reminiscence counseling on a depressed elderly population.

**Uncontrolled threats to validity:**
- Testing
- Mortality

**Instrumentation:**
- Restricted generalizability as control increases
# Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>TREATMENT</th>
<th>POST-TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected control group</td>
<td></td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measurement of independent variables</th>
<th>Measurement of dependent variables</th>
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</table>

**Treatment:** Under control of researcher

**Findings:** Comparison of experimental and control groups


**Uncontrolled threats to validity:**
- Instrumentation
- Mortality
- Limited generalizability as control increases
### Nested Design

#### Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>PRN Medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit E</td>
</tr>
<tr>
<td>Unit B</td>
<td>Unit F</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit G</td>
</tr>
<tr>
<td>Unit D</td>
<td>Unit H</td>
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<th>Unit D</th>
<th>Unit E</th>
<th>Unit F</th>
<th>Unit G</th>
<th>Unit H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Care</td>
<td>No Primary Care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Primary Nursing Care**

- **Unit A**
- **Unit B**
- **Unit C**
- **Unit D**
- **Unit E**
- **Unit F**
- **Unit G**
- **Unit H**

#### New approach: “Around the clock” medication

*Research Design*
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically
- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design